

CLAIMS:

1. A deflectable elongated medical instrument, comprising:
an elongated tubular member having proximal and distal tubular member ends;
a wire coil comprising coil turns wound about a longitudinal coil axis in a coil length extending between proximal and distal coil ends, the coil turns separated apart by a coil spacing, the coil proximal end joined to the tubular member distal end to support the coil in axial alignment with the elongated tubular member;
a longitudinally extending movable wire mounted within the coil and tubular member, the movable wire mechanically coupled at or near the distal end of the wire coil and extending proximally through the coil and tubular member to the tubular member proximal end;
first means for maintaining the coil spacing between a first plurality of coil turns extending in a first line in a first longitudinal portion of the coil when the movable wire is pulled proximally through the coil whereby a first curve is induced in the coils of the first longitudinal portion in a first radial direction from the coil axis; and
second means for maintaining the coil spacing between a second plurality of coil turns extending in a second line in a second longitudinal portion of the coil when the movable wire is pulled proximally through the coil, the second longitudinal portion longitudinally displaced at least in part from the first longitudinal portion along the coil length, the second longitudinal portion displaced circumferentially from the first longitudinal portion, whereby a second curve is induced in the coils of the second longitudinal portion in a second radial direction from the coil axis differing from the first radial direction.
2. The deflectable elongated medical instrument of Claim 1, wherein the first and second radial directions are substantially diametrically opposed.

-24-

3. The deflectable elongated medical instrument of Claim 2,
wherein:

5 the first means couples the coil turns together in the first line in the first longitudinal portion of the coil to inhibit separation of the coupled coil turns when the movable wire is pushed distally through the coil; and

10 the second means couples the coil turns together in the second line in the second longitudinal portion of the coil to inhibit separation of the coupled coil turns when the movable wire is pushed distally through the coil.

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A/ 10 4. The deflectable elongated medical instrument of Claim 1,
wherein:

15 the first means couples the coil turns together in the first line in the first longitudinal portion of the coil to inhibit separation of the coupled coil turns when the movable wire is pushed distally through the coil; and

20 the second means couples the coil turns together in the second line in the second longitudinal portion of the coil to inhibit separation of the coupled coil turns when the movable wire is pushed distally through the coil.

25 20 5. The deflectable elongated medical instrument of Claim 1, further comprising:

third means for maintaining the coil spacing between a third plurality of coil turns extending in a third line in a third longitudinal portion of the coil when the movable wire is pulled proximally through the coil, the third longitudinal portion longitudinally displaced at least in part from the first and second longitudinal portions along the coil length, the third longitudinal portion displaced circumferentially from the first and second longitudinal portions, whereby a third curve is induced in the coils of the third longitudinal portion in a third radial direction from the coil axis differing from the first and second radial directions.

-25-

6. The deflectable elongated medical instrument of Claim 5, wherein the first, second, and third radial directions are substantially equally separated radially apart along the circumference of the coil.

5 7. The deflectable elongated medical instrument of Claim 6, wherein:

the first means couples the coil turns together in the first line in the first longitudinal portion of the coil to inhibit separation of the coupled coil turns when the movable wire is pushed distally through the coil;

the second means couples the coil turns together in the second line in the second longitudinal portion of the coil to inhibit separation of the coupled coil turns when the movable wire is pushed distally through the coil; and

the third means couples the coil turns together in the third line in the third longitudinal portion of the coil to inhibit separation of the coupled coil turns when the movable wire is pushed distally through the coil.

10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95 100 105 110 115 120 125 130 135 140 145 150 155 160 165 170 175 180 185 190 195 200 205 210 215 220 225 230 235 240 245 250 255 260 265 270 275 280 285 290 295 300 305 310 315 320 325 330 335 340 345 350 355 360 365 370 375 380 385 390 395 400 405 410 415 420 425 430 435 440 445 450 455 460 465 470 475 480 485 490 495 500 505 510 515 520 525 530 535 540 545 550 555 560 565 570 575 580 585 590 595 600 605 610 615 620 625 630 635 640 645 650 655 660 665 670 675 680 685 690 695 700 705 710 715 720 725 730 735 740 745 750 755 760 765 770 775 780 785 790 795 800 805 810 815 820 825 830 835 840 845 850 855 860 865 870 875 880 885 890 895 900 905 910 915 920 925 930 935 940 945 950 955 960 965 970 975 980 985 990 995 1000 1005 1010 1015 1020 1025 1030 1035 1040 1045 1050 1055 1060 1065 1070 1075 1080 1085 1090 1095 1100 1105 1110 1115 1120 1125 1130 1135 1140 1145 1150 1155 1160 1165 1170 1175 1180 1185 1190 1195 1200 1205 1210 1215 1220 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7225 7230 7235 7240 7245 7250 7255 7260 7265 7270 7275 7280 7285 7290 7295 7300 7305 7310 7315 7320 7325 7330 7335 7340 7345 7350 7355 7360 7365 7370 7375 7380 7385 7390 7395 7400 7405 7410 7415 7420 7425 7430 7435 7440 7445 7450 7455 7460 7465 7470 7475 7480 7485 7490 7495 7500 7505 7510 7515 7520 7525 7530 7535 7540 7545 7550 7555 7560 7565 7570 7575 7580 7585 7590 7595 7600 7605 7610 7615 7620 7625 7630 7635 7640 7645 7650 7655 7660 7665 7670 7675 7680 7685 7690 7695 7700 7705 7710 7715 7720 7725 7730 7735 7740 7745 7750 7755 7760 7765 7770 7775 7780 7785 7790 7795 7800 7805 7810 7815 7820 7825 7830 7835 7840 7845 7850 7855 7860 7865 7870 7875 7880 7885 7890 7895 7900 7905 7910 7915 7920 7925 7930 7935 7940 7945 7950 7955 7960 7965 7970 7975 7980 7985 7990 7995 8000 8005 8010 8015 8020 8025 8030 8035 8040 8045 8050 8055 8060 8065 8070 8075 8080 8085 8090 8095 8100 8105 8110 8115 8120 8125 8130 8135 8140 8145 8150 8155 8160 8165 8170 8175 8180 8185 8190 8195 8200 8205 8210 8215 8220 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spacing between coil turns and induce a bend in the portion of the coil when the movable wire is pulled or pushed.

5 10. A elongated medical instrument of Claim 9, wherein the pair of short wires are mechanically coupled to individual turns of the coil intermediate the proximal and distal ends of the wire coil.

10 11. The deflectable elongated medical instrument of Claim 9, wherein the elongated tubular member and wire coil are formed of a single elongated wire coil having proximal and distal segments, and the wire coil turns in the proximal segment are tightly wound and/or welded together at spaced apart longitudinal and radial locations to create torque control while maintaining flexibility.

15 20. The deflectable elongated medical instrument of Claim 9, wherein the movable wire is formed having a flattened surface along at least a portion of its length extending alongside the pair of short wires within the coil lumen.

20 25. A deflectable elongated medical instrument, comprising:
an elongated tubular member having proximal and distal ends and a member lumen;

25 30. a wire coil having proximal and distal coil ends and a coil lumen, the coil proximal end joined to the distal end of the tubular member;

a longitudinally movable wire mounted within the aligned member and coil lumens and mechanically coupled at or near the distal end of the coil, the movable wire having a flattened surface; and

30 35. a backbone located within a portion of the coil lumen, extending along one side of the coil and mechanically coupled to the a plurality of turns of the wire coil to maintain the spacing between coil turns and induce a bend in the portion of the coil when the movable wire is pulled or pushed, the backbone having a width greater than its arc height and presenting a flattened or

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arcuate surface facing the flattened surface of the movable wire extending alongside the backbone.

14. A elongated medical instrument of Claim 13, wherein the backbone is mechanically coupled to individual turns of the coil intermediate the proximal and distal ends of the coil.

15. The deflectable elongated medical instrument of Claim 13, wherein the elongated tubular member and wire coil are formed of a single elongated wire coil having proximal and distal segments, and the wire coil turns in the proximal segment are tightly wound and/or welded together at spaced apart longitudinal and radial locations to create torque control while maintaining flexibility.

16. A deflectable elongated medical instrument, comprising:
an elongated tubular member having proximal and distal ends and a member lumen;
a wire coil having proximal and distal coil ends and a coil lumen, the coil proximal end joined to the distal end of the tubular member;
a longitudinally movable wire mounted within the aligned member and coil lumens and mechanically coupled at or near the distal end of the coil, the movable wire having a flattened surface; and
a backbone located within a portion of the coil lumen, extending along one side of the wire coil and mechanically coupled to the a plurality of turns of the wire coil to maintain the spacing between coil turns and induce a bend in the portion of the coil when the movable wire is pulled or pushed, the backbone formed of a weld feed wire welded alongside the exterior of the wire coil to flow between the wire coil turns.

17. The deflectable elongated medical instrument of Claim 13, wherein the elongated tubular member and wire coil are formed of a single elongated wire coil having proximal and distal segments, and the wire coil

-28-

turns in the proximal segment are tightly wound and/or welded together at spaced apart longitudinal and radial locations to create torque control while maintaining flexibility.

18. A deflectable elongated medical instrument, comprising:
an elongated tubular member having proximal and distal tubular member ends;
a wire coil comprising coil turns wound about a longitudinal coil axis in a coil length extending between proximal and distal coil ends, the coil turns separated apart by a coil spacing, the coil proximal end joined to the tubular member distal end to support the coil in axial alignment with the elongated tubular member;
first means for maintaining the coil spacing between a first plurality of coil turns extending in a first line in a first longitudinal portion of the coil;
a first longitudinally extending movable wire mounted within the coil and tubular member, the first movable wire mechanically coupled at or near the distal end of the first longitudinal portion of the wire coil and extending proximally through the coil and tubular member to the tubular member proximal end to induce a first curve in the first longitudinal portion in a first radial direction from the coil axis when the movable wire is pulled proximally through the coil;
second means for maintaining the coil spacing between a second plurality of coil turns extending in a second line in a second longitudinal portion of the coil; and
a second longitudinally extending movable wire mounted within the coil and tubular member, the second movable wire mechanically coupled at or near the distal end of the second longitudinal portion of the wire coil and extending proximally through the coil and tubular member to the tubular member proximal end to induce a second curve in the second longitudinal portion in a second radial direction from the coil axis when the movable wire is pulled proximally through the coil.

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19. The deflectable elongated medical instrument of Claim 18,
wherein the first and second radial directions are substantially diametrically
opposed.

5 20. The deflectable elongated medical instrument of Claim 19,
wherein:

the first means couples the coil turns together in the first line in the first longitudinal portion of the coil to inhibit separation of the coupled coil turns when the first movable wire is pushed distally through the coil; and

the second means couples the coil turns together in the second line in the second longitudinal portion of the coil to inhibit separation of the coupled coil turns when the second movable wire is pushed distally through the coil.

21. The deflectable elongated medical instrument of Claim 18, wherein:

the first means couples the coil turns together in the first line in the first longitudinal portion of the coil to inhibit separation of the coupled coil turns when the first movable wire is pushed distally through the coil; and

the second means couples the coil turns together in the second line in the second longitudinal portion of the coil to inhibit separation of the coupled coil turns when the second movable wire is pushed distally through the coil.

22. The deflectable elongated medical instrument of Claim 18, wherein the elongated tubular member and wire coil are formed of a single elongated wire coil having proximal and distal segments, and the wire coil turns in the proximal segment are tightly wound and/or welded together at spaced apart longitudinal and radial locations to create torque control while maintaining flexibility.

30 23. A deflectable elongated medical instrument comprising:
an outer deflectable wire comprising:

-30-

5 a proximal elongated tubular member having proximal and distal ends and a tubular member lumen;

10 a distal wire coil having proximal and distal coil ends and a coil lumen, the coil proximal end joined to the distal end of the tubular member and the aligned tubular member and coil lumens forming an outer deflectable wire lumen;

15 a backbone extending along one side of the wire coil and mechanically coupled to a plurality of turns of the wire coil to maintain the spacing between coil turns; and

20 a longitudinally inner movable wire mounted within the outer deflectable wire lumen and mechanically coupled to the distal wire coil substantially distal to the backbone to induce a bend in the portion of the distal wire coil when the inner movable wire is pulled or pushed; an inner deflectable wire comprising:

25 a proximal elongated tubular member having proximal and distal ends and a tubular member lumen;

30 a distal wire coil having proximal and distal coil ends and a coil lumen, the coil proximal end joined to the distal end of the tubular member and the aligned tubular member and coil lumens forming an outer deflectable wire lumen;

35 a backbone extending along one side of the wire coil and mechanically coupled to a plurality of turns of the wire coil to maintain the spacing between coil turns; and

40 a longitudinally inner movable wire mounted within the outer deflectable wire lumen and mechanically coupled to the distal wire coil substantially distal to the backbone to induce a bend in the portion of the distal wire coil when the inner movable wire is pulled or pushed; and wherein:

45 the inner deflectable wire is extendable through the outer deflectable wire lumen enabling the independent formation of bends in the portions of the distal wire coils of the inner and outer deflectable wires upon pulling or pushing of the inner and outer movable wires.

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-31-

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24. The deflectable elongated medical instrument of Claim 23,
wherein the inner deflectable wire is rotatable within the outer deflectable wire
lumen enabling the independent formation of bends that are radially displaced
from one another in the portions of the distal wire coils of the inner and outer
deflectable wires upon pulling or pushing of the inner and outer movable
wires.

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25. The deflectable elongated medical instrument of Claim 13,
wherein the proximal elongated tubular members and the wire coils of the
inner and outer deflectable wires are each formed of a single elongated wire
coil having proximal and distal segments, and the wire coil turns in the
proximal segment are tightly wound and/or welded together at spaced apart
longitudinal and radial locations to create torque control while maintaining
flexibility.

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